Open Science and information literacy

Article *in* Journal of the European Association for Health Information and Libraries · March 2021

DOI: 10.32384/jeahil17448

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Open Science and information literacy: case study at a research center

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Abstract
The APPsyCI, a Portuguese research center, decided to incorporate, in all its areas of activity, a research line within Open Science articulated with information literacy (IL). The Open Science assumptions were implemented through several actions: repository management, teacher and researcher training, support for choosing the journals where to publish, dissemination, and promotion of scientific knowledge within FAIR principles. The social and academic impact of the research line provides some light on the national landscape for research innovation and broadens horizons and sheds when combining IL with Open Science. Thus, the creation of this research line within the research center shows that the association of Open Science with IL can be considered as the path and object of applied research.

Key words: *open science; information literacy; research center; higher education; case study.*

Introduction

In 2016, Recommendations for Higher Education Libraries were published in Portugal (1). This document was updated in 2020 (2), presenting four lines of action, converted into 12 recommendations. In both versions, there was a focus on the development of skills, for the librarians to act, aiming at forms of cooperation between professionals and libraries, generating knowledge transfer, and improving their contribution and their social relevance. In the area of support for research, three key ideas stand out: training for Open Science, enabling editorial and scientific and academic publication initiatives, and consolidating strategic partnerships to support research.

In 2017 the APPsyCI (Applied Psychology Research Center Capabilities & Inclusion, https://appsyci.ispa.pt/) research center was born in a private university of applied psychology (ISPA - Instituto Universitário). The APPsyCI decided to incorporate, in all its areas of activity, a line of research within Open Science articulated with IL. For its pursuit, it invited three librarians to join the research center from the very beginning in a mission of collaboration with the other researchers: Carlos Lopes, Ph.D., integrated researcher, library director, and assistant professor in psychology; Tatiana Sanches, Ph.D., collaborator researcher, a head librarian who works at the University of Lisbon; and Maria Luz Antunes, a Ph.D. student in information science, integrated researcher and head librarian at the Polytechnic Institute of Lisbon.

The scope of Open Science at APPsyCI has translated into a collaborative and transparent process of dissemination, creation, and transfer of knowledge, access to research, and based on the principles of open access. Equipped with a set of IL skills, in a digital information environment, and based on their own critical and reflective thinking, the different agents of the research process were enabled to transform information into new knowledge.

The inclusion of librarians in the APPsyCI made it possible to identify their area of expertise and what the research center expected from them, that is: their specialization in the association between Open Science and innovation in research; civic involvement and educational development; and increased IL in higher education.

This study aims to demonstrate the relevance of the integrated work of librarians, highlighting strategies and practices that link Open Science to IL in a research context.

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Journal of EAHIL 2021; Vol. 17 (1): 4-8 doi: 10.32384/jeahil17448

Methods

The case study methodology was used to describe and explain the formative practices and collaborative strategies put into action between librarians and researchers. Case studies allow us to analyze concrete contemporary situations and to consider their contextual influences (3). Their main advantage is that they provide the analysis of reality, allowing reflection and decision-making about future perspectives.

The application of this method presents a qualitative analysis of the APPsyCI research center, divided into two stages: a) the organization of the research center; and b) according to the needs of researchers, the answers found by librarians.

Results

Characterization of the research center

The APPsyCI is composed of 32 integrated PIs, 17 collaborators, and 12 integrated non-doctors, of which 10 are Ph.D. students. The overall aim is to strengthen the capacity of individuals, groups, families, organizations, and institutions to develop solutions to concrete societal and complex problems across the lifespan, promoting collaborations amongst the public, private, and non-profit sectors. It was structured to: a) (in)form innovative social policies at the national and European levels through effective and evidence-based social community interventions on contemporary societal challenges; and b) provide opportunities to explore internationalization and cross-fertilization of innovation potentials and interactions among research, intervention and teaching/learning in Psychology and other Social Sciences (*Figure 1*).

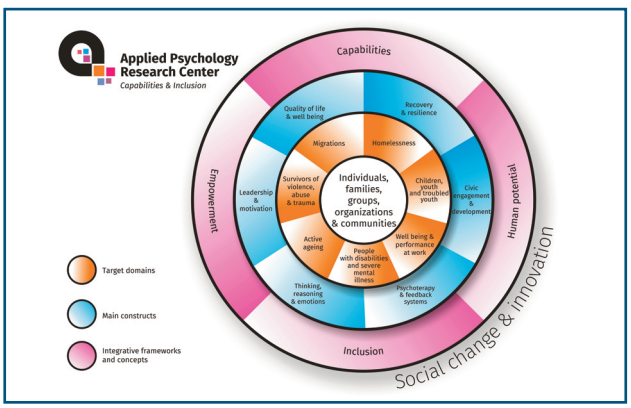

Fig. 1. *Explanatory model of the research center.*

Topics as migrations, homelessness, mental health, children and youth well-being promotion, institutionalization and integration programs, or active aging are amongst the selected topics for research and intervention. For example: people, groups, or communities who experience singular or cumulative harmful, life-threatening, or isolating experiences such as physical and mental health, disabilities, extreme poverty, forced migration, violence and abuse, persistent educational failure, having gender and age as a transversal concern.

The APPsyCI also consider the pertinent in-depth study of the protective effects of psychological well-being on physical health outcomes, and the effectiveness of Psychotherapy including in-vivo and on-line evaluation tools and platforms; and also the increase multi-sectoral collaboration research and intervention on educational development from early stages to higher education through broad-based ecological and multicultural approaches, civic engagement, IL, and social development to promote the development and interrupt intergenerational poverty cycles.

All these aims and specific purposes are to be operationalized within Open and Citizen Science principles, and translated into collaborative, transparent dissemination strategies, potentiating the creation and transfer of knowledge, made accessible to stimulate the practical uses of scientific outputs to benefit people and social contexts. The connections and university-community partnerships at the national and international levels ensure the dissemination of the APPsyCI production in the academia and the broader societal spheres and publics, guaranteeing the aim of producing socially relevant and useful science.

The research center intends to be actively engaged and emerged in the contemporary societal challenges, contributing to change and development following and potentiating a path that is already started.

The librarians' response

The most significant issues gathered by librarians in relation to the needs expressed by APPsyCI researchers are listed below:

- How to select journals to publish according to the scope of the study, funding criteria, and impact factor?
- How to identify predatory journals?
- Where can I check the impact factor of a journal?
- What is the difference between the green and gold roads in open access?

- What is APC?
- How to manage references?
- How to disseminate scientific data in Zenodo?
- How to disseminate a recently published article?
- How to place an article in the institutional repository?
- What is the difference between the institutional repository and ResearchGate?
- How to manage and integrate information in ORCID?
- What is the difference between the impact factor and the impact of research?

In addition, the APPsyCI itself had objectives for measuring scientific activity, so it was necessary to ensure, with the support of librarians: the creation of ORCID profiles and others; standardization of criteria for validation of scientific production; and the standardization of the citation forms.

The APPsyCI has implemented the assumptions of Open Science through several actions: management of repositories, training of teachers and researchers, support in choosing the journals to publish, dissemination, and promotion of scientific knowledge under the FAIR principles. According to their premises, librarians have organized their work in several areas, namely:

1. promoting, through training and dissemination, the knowledge and practice of open access, open data, and open sources among APPsYCI members;
2. monitoring the scientific production, evaluating, and ensuring the implementation of Open Access institutional policies;
3. disseminating and facilitating the implementation of policies of science funding agencies;
4. supporting and cooperating with the services and projects of the APPsyCI, promoting the curatorship of scientific data (in development);
5. linking the information of funded projects to published results (using OpenAIRE repositories and guidelines);
6. promoting the digital identity of APPsyCI members and promoting their communication, dissemination, and impacts;
7. promoting IL and its contributions to Open Science.

As part of this work, librarians have written a set of reference documents for researchers, for their academic communities, but also for other librarians, as an incentive for their active and effective participation in research groups. The first e-book on IL in higher education was written at the end of 2016 (4), two chapters in a book in 2018 (5, 6) and another book edited in the summer of 2019 (7). A glossary on Open Science (8) was prepared, a practical project and work in-progress, and which was made available on the Portuguese government website for science and technology. Some oral communications were presented at ECIL 2017, EDICIC 2017, and APDIS 2018, evoking IL as one of the steps towards Open Science. Three articles were also published on the same theme, in Portuguese, Spanish, and English (9-11). Some workshops, seminars, and webinars on the theme were held. Librarians also participated in the translation into Portuguese of the *Open Science Training Handbook* (12) and joined several scientific committees of national (APBAD, APDIS) and international (ConfOA, ECIL, IATUL, TEEM) events. Also, the transversal nature of IL associated with Open Science led to the active participation of the three librarians in some national networks and working groups, as well as in the development of a continuous training course (24 hours) subordinated to research resources in an Open Science field and a post-graduation in health literacy (http://fa.ispa.pt/cursos/literacia-em-saude-na-pratica-modelos-estrategias-e-intervencao-3-edicao-formacao-online), in 2018, a pioneer in Portugal.

In summary, the investment of librarians in APPsyCI focused on areas such as Open Science and innovation in research; civic engagement and educational development; IL in higher education, where the study and application of academic and information skills based on Open Science principles translate into a strategy of collaborative and transparent dissemination; and the strengthening of knowledge transfer and its practical use for the benefit of people and society.

Discussion

The social impact of the APPsyCI research line is a process under construction.

The three librarians have studied the creation and adaptation of information assessment tools in higher education and incorporated Open Science as the best practice in the use and management of information. All the research developed depends on the possibilities of researchers to access and share scientific informa-

tion. In this context, research strongly supports open access and reuse of research data.

Science and societal change must respond to the increasing interactions between research and innovation (e.g., Citizen Science, peer review in funding agencies, co-creation of public policies, agenda-setting, co-production, and co-evaluation of research and innovation programs and content). APPsyCI's actions aim to implement citizen involvement in science, formal and informal science education, ethics and integrity of research, and open access to research results. The work of librarians in close collaboration with researchers has contributed to the projection of the group's research at national and international levels, to enhance FAIR data in the research process, promote scientific capital and critical mass around Open Science, encourages its researchers to adopt Open Science and its principles, but also helps to incorporate new skills courses in doctoral programs.

Curiously, the collaborative work developed with researchers follows the recommendations for higher education libraries, which were revised and published in May 2020, within the scope of the Portuguese association of librarians (2). The second axis of the new recommendations is aimed at supporting research and defines that it is necessary to train librarians for Open Science and that strategic partnerships between librarians and researchers should be consolidated in a permanent culture of collaboration. In the search for more strategies for libraries to remain relevant, it is necessary to reposition and incorporate librarian knowledge into teaching, learning, but also research initiatives; one possible way to achieve this is for librarian professionals to collaborate on research projects (13).

In the near future, the line of research on IL associated with Open Science created by APPsyCI is intended to:

- encourage researchers to join the Open Science movement;
- increase effective partnerships among researchers, librarians, scientific managers, institutions, and funding agencies;
- invest in the development of librarians' skills;
- develop a post-graduate course in IL in Open Science;
- devote special attention to specific projects that deal with IL, digital, and Open Science.

It is, therefore, necessary to value information (and for what it represents in terms of rights and the exercise of citizenship) and to understand that its mastery, i.e., literacy, is an essential investment in the context of science because it is a significant mechanism for lifelong learning. The mastery of these skills will enable researchers to become more critical and able to intervene in society.

Conclusion

The creation of this line of research within the APPsyCI demonstrates that the association of IL with Open Science can be considered as the path and the objective (middle and end) of applied research. It is therefore a civic and scientific commitment to education and research development, which encompasses the challenges that have reconfigured teaching/learning and scientific dynamics in higher education.

The study and application of scientific and information skills in higher education, operationalized within the principles of Open Science, translated into collaborative and transparent dissemination strategies, enhances the transfer of knowledge, and enhances the impact of scientific results.

What are the practical implications of this interface for librarians in the research center? For APPsyCI researchers the advantages are: compliance with funding requirements; greater visibility and impact of research; the possibility of funding and support; possibility of new collaborations; greater transparency; the possibility of debate; potential reuse of data; citation of created data; and the preservation of scientific data. For APPsyCI the advantages are: greater visibility of the work of its researchers; greater transparency; the alignment with the recommendations of the largest national research funding agency; and the alignment with good international practice. The present case study, although limited in observation, as it is circumstantial to a very concrete reality, allows other professionals to glimpse the potential for collaboration between librarians and researchers, with benefits for both.

Acknowledgements

The authors of this paper received the award for best oral presentation overall at the EAHIL Virtual Conference "Be Open, Act Together", 16-18 November 2020, Lódź, Poland.

Submitted on invitation.
Accepted on 2 February 2021.

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